

Claims 28 and 30 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 4,803,124 to Kunz or U.S. Patent 5,187,123 to Yoshida et al.

Kunz and Yoshida et al. do not anticipate the present claims.

The present invention relates to an article for fabricating large liquid crystal displays. The present invention provides a flat cover plate and a flat back plate bonded together by an adhesive that is void-free and exhibits a wavelike undulating profile at edges of one of the plates.

A variety of industrial and commercial applications require bonding surfaces together and, in certain instances, flat surfaces having relatively large areas. Included in these applications are microelectronics applications for bonding liquid crystal display assemblies and especially relatively large liquid crystal display assemblies and heat-sink attachments, and such commercial applications as windowpane glass and auto windshield applications. When laminating or bonding flat surfaces with a liquid adhesive, the ever present problem of air entrapment requires special attention. For instance, even though a surface may appear flat or planar, small topographic variations allow contacting at multiple points during mating. As the adhesive spreads from such multiple points, the advancing fronts can meet and thereby trap pockets of air.

The larger the area of the mating surface, the higher the incidence of air entrapment. Furthermore, the lower the viscosity of the adhesive, the higher the incidence of air entrapment.

Trapped air, depending upon the desired product, presents problems of varying degrees. For instance, when dealing with bonding large liquid crystal display assemblies, the individual LCD tiles are arranged in a matrix and secured to a tile carrier. The tile carrier typically includes a cover plate and a back plate with the LCD tiles sandwiched between them. The bonding of the back plate and cover plate to the liquid crystal display tiles should be as void-free as possible. In order to achieve a void-free bond, proper dispensing of the adhesive mass along with providing a pattern that allows spreading out

from the center outward and sweeping air out as the front advances must be achieved. In addition, the surfaces to be bonded must be mated parallel to each other. It is also desirable that the point contact of the mating surfaces with the adhesive between them be controlled and that the pattern employed permit complete coverage of the surface area of the mating substrates regardless of shape such as rectangular, square or polygon. Also, it is necessary to control the bond line.

With respect to these requirements, the proper dispensing of the adhesive mass can be readily achieved employing metered dispense units well known in the art. Moreover, as described in the specification, it has previously been determined that an X pattern extending the entire diagonal length of the surfaces to be bonded is necessary for achieving complete coverage. Furthermore, a majority of the adhesive should be dispensed in the center of the adhesive pattern since spreading is initiated in the center, and spreads out radially. Nevertheless, it has been found that regardless of the pattern geometry in the center, e.g. circular, elliptical, square, smaller scale X pattern and the like, the geometry of the spreading area quickly reverts to circular or elliptical. However, even when employing an X pattern with the diagonal spokes extending all the way to the corners of the surface to be bonded, a void-free bond line is not necessarily achieved.

The present invention addresses the above concerns and results in a void-free bond.

U.S. Patent 4,803,124 to Kunz does not anticipate the present claims and does not result in a void-free bond or undulating at edges of the adhesives. In fact, Kung is similar to the prior art discussed in the specification.

The process suggested by Kunz is along the lines of the processes discussed on page 3 of the specification and suffers from the same shortcomings disclosed in the specification. In particular, as disclosed in the specification, even with a majority of adhesive in the center and employing an X pattern, a void-free bond line is not necessarily achieved when dealing with large area surfaces.

Kunz relates to dispensing die attach adhesives. The present invention is especially concerned with bonding relatively large area surfaces together such as liquid crystal displays (see claim 32). Significant differences exist between void-free die and void-free LCD bonding.

For instance, dies range in size typically from 0.08 to 0.8 inches square. LCDs, on the other hand, typically are 14 inches by 10 inches and coverplates are four times as large in area, being 28 inches by 20 inches. Some level of voiding is tolerable in die attach and indeed occurs characteristically with die attach materials, notwithstanding the suggestions in Kunz. In order to tailor the dispense rheology for high speed, controlled volume dispensing, adhesive manufacturers use reactive diluents and low molecular weight starting monomers. The adverse effect of this material design is that during cure, the reactive-diluent and sometimes even the monomer will volatilize and cause noticeable voiding, thus defeating the benefit of Kunz. This voiding is very common and is readily observable by bonding a chip to a glass slide with the die attach adhesive.

In contrast, the LCD application must be optically clear. Any void between the LCD and coverplate stands out and is a blemish to the viewer. Essentially, the objective of LCD applications is to eliminate voids entirely and over an area that is two orders of magnitude larger than chip attach applications.

Also, the die attach and LCD applications differ from each other in rheology of the adhesive. While the die attach materials are thixotropic or resisting a natural tendency to flow and self level, the LCD adhesives need to possess a high propensity to flow, in order to wet the very large surface areas with a reasonable mating force. Consequently, on dispensing the LCD adhesive to a coverplate in preparation for LCD mating, the adhesive immediately begins to flow and self level. Self leveling is in opposition to void-free mating because it presents a flat surface over a large area. Mating large area adherents with an intrinsically self leveling adhesive interposed will always experience multiple point contacts. Thus, several flow fronts grow and when these merge, frequently a

pocket of air is trapped. One of these will result in a scrapped LCD assembly. As discussed above, this is the problem addressed by the present invention.

Moreover, the adhesives suggested by Kunz would not be suitable for LCD assemblies since they are not clear as would be required for a LED. The adhesives of Kunz contain metallic particles such as silver. See col. 4, lines 1-4. Moreover, the adhesives of Kung are not self-leveling but instead retain their shape after being dispensed. In other words, these adhesives are thixotropic and contain filler.

Accordingly, the technique suggested by Kunz would not inherently result in a void-free bond in the articles of the present invention and could not inherently result in the adhesive being undulating at its edges. The adhesive of Kunz would be wavy or elliptical over its bond area.

Yoshida et al., like Kung, relate to a die attach process and not an LCD application employing a paste presented in an array of spots. The specific adhesive is a silver epoxy paste. The paste and process of this reference would not inherently result in a void-free bond over the much larger area as required by the present invention. Also the perimeter of the adhesive would not be undulating but instead, regular such as circular or elliptical. In addition, the adhesive paste suggested by Yoshida et al. would not be suitable for LCD assemblies since they are not clear as would be required for a LCD. The adhesives of Yoshida et al. contain silver particles.

Wolkowicz  
Claim 28 and 30 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 5,886,763 to Wolkowicz. Wolkowicz does not anticipate the present claims. Wolkowicz is not concerned with bonding the cover plate and back plate of a LCD assembly. Wolkowicz relates to bonding a bus bar to a conductor heater layer using a Z-axis conductive adhesive. The adhesive of Wolkowicz and method of bonding would not inherently result in a void-free bond and wavy profile at the edges.

The adhesive of Wolkowicz requires electrically conductive particles. Accordingly, the adhesives of Wolkowicz could not be suitable for bonding the back

plate to the cover plate since they are not clear.

Claim 29 was rejected under 35 U.S.C. 103(a) being unpatentable over Kung or Yoshida et al. or Wolkowicz and further in view of Gilleo (U.S. Patnet 5,531,942). The cited references do not render obvious claim 29.

Gilleo was merely relied upon for a disclosure of silver pastes that are thermosetting adhesives.

Gilleo does not overcome the above discussed deficiencies of Kung, Yoshida and Wolkowicz with respect to rendering unpatentable the present claims.

The cited references fail to anticipate the present invention. In particular, anticipation requires the disclosure, in a prior art reference, of each and every recitation as set forth in the claims. *See Titanium Metals Corp. v. Banner*, 227 USPQ 773 (Fed. Cir. 1985), *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 1 USPQ2d 1081 (Fed. Cir. 1986), and *Akzo N.V. v. U.S. International Trade Commissioner*, 1 USPQ2d 1241 (Fed. Cir. 1986).

There must be no difference between the claimed invention and reference disclosure for an anticipation rejection under 35 U.S.C. 102. *See Scripps Clinic and Research Foundation v. Genetech, Inc.*, 18 USPQ2d 1001 (CAFC 1991) and *Studiengesellschaft Kohle GmbH v. Dart Industries*, 220 USPQ 841 (CAFC 1984).

Furthermore, the cited references do not inherently disclose the present invention. For instance, see *In re Robertson et al.* 49 USPQ2d 1949 (1999 Fed. Cir.). In this case, Robertson, filed a patent application concerning a paper diaper. The application claimed a paper diaper having (a) two fasteners so that the diaper could be worn on a baby and (b) a third fastener for rolling up and fixing the used diaper. The Patent Office rejected the invention under 35 USC 102 based on "Principles of Inherency" as the invention is "anticipation" by the prior art.

The prior art (Wilson) relied upon disclosed a diaper, which had two snaps in front and back of the diaper in order to be worn by a baby and which may further have a strip in order to fasten the diaper to baby's body. Wilson describes that the used diaper can be easily dealt with by rolling up and fixing it with the snaps. Accordingly, the Patent Office considered that the diaper of Wilson inherently has an ability to be rolled up and fixed after use and decided that the claimed diaper is anticipated by the diaper of Wilson. The Federal Circuit; however, held that it is recognized that the constitution of the invention is inherently present in the prior art, only when it is clearly shown that the constitution of the invention is necessarily present in the prior art by external evidence. The invention can not be rejected based on "inherency" because of probability or possibility of the presence of the constitution in the prior art. Also see *Crown Operations International Ltd. v. Solutia* 24 USPQ 2d 1917 (Fed. Cir. 2002).

Also, the cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render under 35 USC 103 sustainable. The cited art fails to provide the degree of predictability of success of achieving the properties attainable by the present invention needed to sustain a rejection under 35 USC 103. See *In re Lee* 61 USPQ2d 1430 (Fed. Cir. 2002), *Diversitech Corp. v. Century Steps, Inc.* 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 187 USPQ 774 (CC)A 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966).

Moreover, the properties of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d. 1923 (Fed. Cir. 1990), *In re Antonie*, 195, USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

No property can be ignored in determining patentability and comparing the claimed invention to the cited art. Along these lines, see *In re Papesch*, supra, *In re Burt*

*et al*, 148 USPQ 548 (CCPA 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

In view of the above, consideration and allowance are, therefore, respectfully solicited.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Director is hereby authorized to charge any fees, or credit any overpayment, associated with this communication, including any extension fees, to CBLH Deposit Account No. 22-0185.

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Respectfully submitted,

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APPENDIX-MARKED-UP VERSION OF AMENDMENTS TO SPECIFICATION

**In the Specification**

Please substitute the following the paragraph beneath the heading:

“Cross-Reference to Related Application”

This application is a divisional of copending U.S. application S.N. 09/057,630, filed April 9, 1998, now U.S. Patent 6,174,406.